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HIGH FIELD STRENGTH AND RARE EARTH ELEMENT CONCENTRATIONS IN THE KAMCHATKAN ARC: INSIGHTS INTO MAGMA GENESIS AND SEDIMENT RECYCLING

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Although substantial progress has been made in determining the relative roles of the subducting slab, the overlying mantle wedge and the arc crust in the petrogenesis of arc magmas, controversy remains. We recognize that the chemical complexity observed in island arcs volcanic rocks stems, in part, from real differences between the geodynamical constraints that ultimately influence island arc genesis. Efforts to delineate the specific conditions that control the observed characteristics will result in a better assessment of global elemental fluxes recycled in island arcs. Toward this effort, we have undertaken a geochemical study of several Quaternary volcanoes in the Kamchatkan arc as it has erupted some of the most primitive basaltic magmas found in island arc settings. Primitive basalts can provide the least equivocal information on the nature of the source and the dominant processes occurring between the subducting components and the mantle wedge.

High quality data for low-level trace element concentrations in volcanic rocks, specifically the high-field strength elements (HFSE), have been nortoriously difficult to measure accurately. We have successfully used inductively coupled plasma mass spectrometry (ICP-MS) standard dilution to measure HFSE (Nb, Ta, Zr, and Hf), rare earth elements (REE), Th and U of a suite of volcanic rocks by ICP-MS. Precision is good, generally better than 5%. The samples were chosen from a sub-set of rocks that we have previously analyzed for major and trace element concentrations and radiogenic (Pb, Nd and Sr) isotope ratios. Preliminary results (low Ce/Pb~5ppm, depleted Nb values, MORB-like Pb and Nd isotope ratios, and elevated LILE and Sr isotope ratios) can best be explained by a fluid-fluxed mantle wedge resulting from dehydration of the altered crust, and not melted subducted sediment.

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